# 'Creating the melody of the future'

## An interview with Martin Strid, Anders Forsberg and Daniel Moback on LL#22 BEAst-ELSA[1]

*Living Lab #22 revolves around the goal of sustainability and circularity in the Swedish construction sector, and the public-private data exchange that is needed to work towards that goal. Therefore, this Living Lab does not fully match the focus on supply chain visibility that is prevalent in other Living Labs. There is no talk about estimated times of arrival here. Instead, there is talk about 'excavation masses', the fuel consumption of lorries moving those masses, or the type of hydraulic oil used by excavation machines. The Living Lab runs pilots on public-private data exchange with construction industry standard BEAst and digital system ELSA of the Swedish Transport Administration. In this interview Martin Strid represents the Transport Administration (Trafikverket), while Anders Forsberg and Daniel Moback represent CLOSER.*

Martin Strid is a character. He does not go unnoticed on FEDeRATED meetings. I saw him play the harmonica and wear a fancy hat at the FEDeRATED-gathering in Delft, March 2022. Martin is Climate Effect Coordinator for the division Maintenance of Trafikverket, the Swedish Transport Administration, and he is the initiator of the BEAst-ELSA project. After telling me his English is "a bit rusty", and using Swedish words that can be understood by a Dutchman like me, Martin sighs, and says: "England is not part of the EU anymore, so why do we talk English anyway?" A typical, somewhat disruptive Martin Strid-remark.

Anders Forsberg and Daniel Moback work at CLOSER, the Swedish organization that coordinates projects in which academia, industry and public sector collaborate in order to make freight transport more sustainable and efficient. Daniel is project manager at CLOSER, dealing with several FEDeRATED Living Labs, while Anders describes his job as "dealing with government affairs and innovation deployment within CLOSER". Anders: "The past four years I have been Senior Project Leader, but now I am switching to connections with the political scene and sectoral organizations in the construction industry, and also from the bio-side." And "I come in just before the scale-up of innovation in the market."

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[1] *Interview by Minne Buwalda*

## Aiming for efficiency and sustainability



Anders starts explaining the context of the BEAst-ELSA project: "The building and construction ecosystem accounts for 10 to 15% of Sweden's Gross Domestic Product –this includes the material flows, for example the production of concrete and steel. There is a similar situation in the Netherlands." Such a percentage means that digitalizing the industry for the purpose of efficiency is of great importance. Anders comes with a comparison: "The automobile industry has a global digital supply chain for material flows, and they work with just-in-time-deliveries since 1985. That is why a car is affordable for you and me. But the construction industry does not have a fully operational digital supply chain yet - many of them still have an analogue way of working, so with paper documents- and they do not work with just-in-time-deliveries. So, they are some 25 years behind and need to catch up." To which he adds: "That is why construction, for example the construction of houses and roads, is expensive in Sweden. This inhibits growth in this sector."

Besides the efficiency goal, which is mainly dealt with in the BEA-standard –it is primarily commercial data that are exchanged within BEAst– sustainability and circularity are important goals, and this is where ELSA, the digital system of Trafikverket, one of the administrations that deals with sustainability in Swedish construction and transport, comes in.

## How it all started

Martin knows how the coupling of the construction industry's BEA-standard and ELSA started. Martin: "Trafikverket was formed nearly 13 years ago by merging the Swedish road and railway administrations. It is divided into the divisions Traffic and Maintenance, and I work for Maintenance." And: "Some nine years ago I started a project on conditions for contractors from the construction industry on how to comply with our governmental sustainability goals in terms of climate. Until then, all the information was sent by way of paper and I wondered: how do you know all this is true? This needs to be digitized and automatized. That is how it started, and I still run the project within Trafikverket." He continues: "We realized that, for the contractors to be able to give us the information digitally, they need some kind of support. One possible solution that would comply with our needs as government agency was the existing industry standard called BEAst. Therefore, since 2017 Trafikverket is a member of the association that runs BEAst."

BEAst is governed by its members, mainly from the construction industry. And since 2017 the member that represents the biggest piece of the construction cake, is the Swedish government. Martin: "We, as the administration, order about one third of the building and maintenance contracts in Sweden. We comprise one third of the construction market."

Martin leans back in his chair and starts telling a story: "I was in a BEAst committee-meeting in 2018. There were people from building companies, material providers, transporters… and I was there for Trafikverket – the only one from government. During the session a young lady said 'we use this BEAst program since 2012 and we have been running more that 400 projects and everybody involved thought it was very good and we do not want to go back to the old system, but still, it is not spreading. Why is that?' Then an elderly gentleman said: 'Before somebody invests in this system, they want to be sure it is the system that will be used in the future. And how do they know that?' Then somebody said: 'Large buyers must go first', and everybody looked at me. So, that is the road we are on now."

## The BEAst coupled with ELSA

BEAst needs to support the Swedish construction industry's transition to e-business. In its promotional documentation this standard presents itself as focusing on the whole Nordic region, even though "the BEAst is located in Sweden".

BEAst has been developed bottom-up by the industry for the last 10 years, and it includes standards like BEAst Trade, for EDI-based e-commerce; BEAst Supply Material, for deliveries to construction sites; BEAst Supply NeC, for freight services of aggregate products and machine services; and BEAst Invoice, Catalogue and Project list messages. The standard offers functionalities for web invoicing and order management; A PEPPOL access point (AP) and registry (SMP) for more efficient infrastructure; and the validation of files.

Martin: "About 115 organizations are member of BEAst, many of them building companies, transporters and material providers. There are also some consultants, and about 10 branch organizations, one of them being the Swedish Association of Transporters. About 5000 companies are member of that branch organization alone. Other examples of branch organizations that are a member of BEAst are the Building Materials Association, and the Recycling or Waste Management Industry Association."

ELSA, the Trafikverket digital system for internal use, aims to monitor operational energy and material flows due to contract works, starting with fuel climate gas emissions and the transport of excavation masses. Martin: "ELSA is the Swedish Transport Administration's tool for receiving data in BEAst-format from contractors. The idea is that contractors collect the same information from their sub-contractors and pass them on to us." And:



"We do what we like with ELSA. We develop the things that our project managers tell us they need. We want to know how much carbon dioxide is emitted and, most of all, what the energy turnover is per district, per kilometer, per kind of machine, per kind of work." After a pause, he continues: "But besides carbon dioxide, there are many more elements in our periodic system. Think about mercury. If we as Trafikverket can get a system where you buy lamps for street lighting containing mercury, and you know that in such and such district the electrical equipment contains a total of 12.3 kilograms of it, you can start dealing with the mercury in a circular manner. This is just one example of what you can do with BEAst-ELSA."

**Pilots**

Asking Martin about the pilots with Living Lab #22, he says: "We have three pilots running now, one is finished", and then he starts explaining a pilot running in Gothenburg: "Here we build traffic tunnels in the center of the city. A number of contractors is involved, one of them called NCC, which transports the soil that is dug up for the tunnel to deposit sites. They keep track of these masses and report that information in the BEA-standard to us. For almost 1.5 year, until September 2022, they have reported the transport of over 100.000 tons of excavation masses. Which lorry, starting from where, going to which destination, carrying how much excavation masses." In a video on this pilot, an NCC-man says: "The best part is that we can use existing solutions (read: BEAst) to document and manage these masses, and that we can obtain a lot of data that we can re-use in our internal systems for follow-up and capacity management, or order flow support, amongst other things."

Anders brings up a pilot running in Stockholm: "The construction industry in Stockholm already use BEAst on an operational basis. Rocks from building sites in Stockholm center are being transported to the harbor where the rocks are crushed and cleaned, so they can be reused in new building projects. After one year we can see that this way of working with BEAst works well." Anders describes it as one of the 'best practices' that move the project forward.

Martin: "BEAst can be used for many purposes. We started with fuel and carbon dioxide, because it is easiest to get a 'yes' if your issue is a general priority. The re-use of materials is another part. You can also add invoice information, project progress and so on. All this can come in the same electronic message. You just choose what data fields you want them to fill in and that's what they will do."



## Aligning the segments of the construction industry

According to Anders, the Swedish building industry consists of four market segments, namely 1. excavation masses; 2. building of houses; 3. renovation of houses; and 4. demolition. Anders confirms that in this fourfold division the idea of circularity is worked out -the cycle from raw material to product back to raw material.

Asking Anders about the segment called 'excavation masses', he says: "This mainly has to do with the construction of roads, tunnels etc. The segment comprises some 30% of all the business in construction." And: "The sharing of digital information within the building industry is done mainly in this segment, and since the Swedish government is the biggest purchaser of 'mass-excavations', they can lead in setting the standard concerning sustainability here." To which he adds: "But the BEA-standard also has a proven track record in the building of houses segment. Their main focus is on statistics, data sharing and sustainability."

So, it looks as if this industry standard is up and running? Anders: "Yes, but the problem is that these four segments do not always talk to each other, while they often deal with similar information." So, work needs to be done to align the data exchange between the four segments.

## Aiming for a 'single face to industry'

Besides the alignment of the four industry segments, there is also an alignment needed of the government agencies making use of BEAst. Anders: "We want to work with the Single Face To Industry principle, so the construction industry and the transport industry can easily share data with involved government agencies in a standardized way." What government agencies is Anders talking about here? "Besides the Swedish Transport Administration, the two other government agencies involved at the moment are the Environmental Protection Agency and the Swedish National Board of Housing, Building and Planning. But these agencies have different requirements on reporting environmental data." He continues: "Unifying the way government agencies work is a challenge,

because the three authorities involved are still silo's when it comes to requirements for data sharing. Yet, we need the government to talk with one single face to the industry, with the same requirements on how to share data when it comes to construction, logistics and environmental data." That's a pretty big task at hand.

Martin complements Anders' story. He says: "Since two years the Environmental Protection Agency has been collecting data on masses deposits digitally. The Board of Housing have been running their data collection on energy requirements of new buildings for one year now. We try to make them understand that we can use the same data flow. And I believe there are people within these agencies who start to understand where we want to be going with this." To which Martin adds his hope for the future: "I hope we can start using the same language, so the contractors do not need to send different messages to government agencies about the same thing." That 'same thing' is first of all environmental data collection.

Martin continues: "Contractors do not want to work with several portals and computer programs for sharing the same kind of data. They just want to push the send button, and get the data automatically to all the customers and agencies involved. This is called efficiency, and this is where we are going. The market was at a point where they were going for a multi-portal solution. We are just in the last minute to prevent this." Then Martin comes with a historical comparison: "The situation resembles the first days of rail transportation in Great Britain, where different companies and districts developed their own standard, resulting in different widths of train tracks throughout Great-Britain. Bismarck learned from that, and had one rail width standardized in Germany. That's why Germany won the war with France."

## FEDeRATED global features

So, in this Living Lab there are different types of alignment to be worked out. First of all, the alignment of the four segments from the construction industry; secondly, the alignment of government agencies that exchange environmental data with this industry. And since this is an interview as part of FEDeRATED, we also need to talk about a third alignment here: the alignment between the Swedish solution developed in Living Lab #22 and the FEDeRATED guidelines.

### *Publish and Subscribe*

One of those FEDeRATED guidelines deals with the need for a pull mechanism for data sharing. This entails that stakeholders do not send requested data directly (to government), but only share links to those data, so the data stay within the database of the data owner. This way, everyone has their own data and a set of links to other databases, and data stay 'at source'. The mechanism is called 'publish and subscribe' in FEDeRATED terms.

Asking Martin if this pull-mechanism is applied in the BEAst-ELSA project, he avoids the topic of 'publish and subscribe' and focusses on 'data at source': "In our case each company, each contractor and subcontractor is owner of its own data, and they share data with us, but not all their data. At this stage, we as government are not interested in business data like the price. We are interested in the

fuel consumption and what kind of fuel is used, so we can calculate the carbon dioxide emissions and the excavation masses transported. All these companies are still owner of their own data. This has to do with business interests. You don't want everybody to know what you are doing in business terms." To which Daniel adds: "Up till now the connection between BEAst and FEDeRATED was not that clear. Therefore, we agreed to do some complementary reporting and update the Factsheet."

### Access

Since 2014 in Sweden all invoices for government agencies have to be in PEPPOL standard, and the same goes for municipalities. As of late, BEAst also uses this Pan-European Public Procurement Online standard. Martin: "We, from Trafikverket, suggested BEAst to use PEPPOL. First they did not want to, but then their new executive said: maybe we can. And one year later, since the second half of 2022, they use PEPPOL."

### Semantics

The Factsheet of LL#22 states that the main emphasis of the project is "to establish a common future path for the applicable semantics and data exchange mechanism regarding environmental data for construction and maintenance works for road and rail infrastructure". In the meantime, some of the semantics used is uniformed. Martin: "In our pilots we talked to the technical providers on a regular base, and together we made an inventory of all the problems related to the language used. But there is a lot of details that still need to be sorted out." Martin continues: "When it comes to computer language, then I am a bit lost. But we have uniform words for the kind of work we are doing, the things we are sending, articles and so on. We use the Swedish Transporters Federation list of articles in terms of vehicles and machinery, their size and capacity. But we do not need that kind of detail in our project. We need other kinds of detail, like the kind of hydraulic oil they are using."
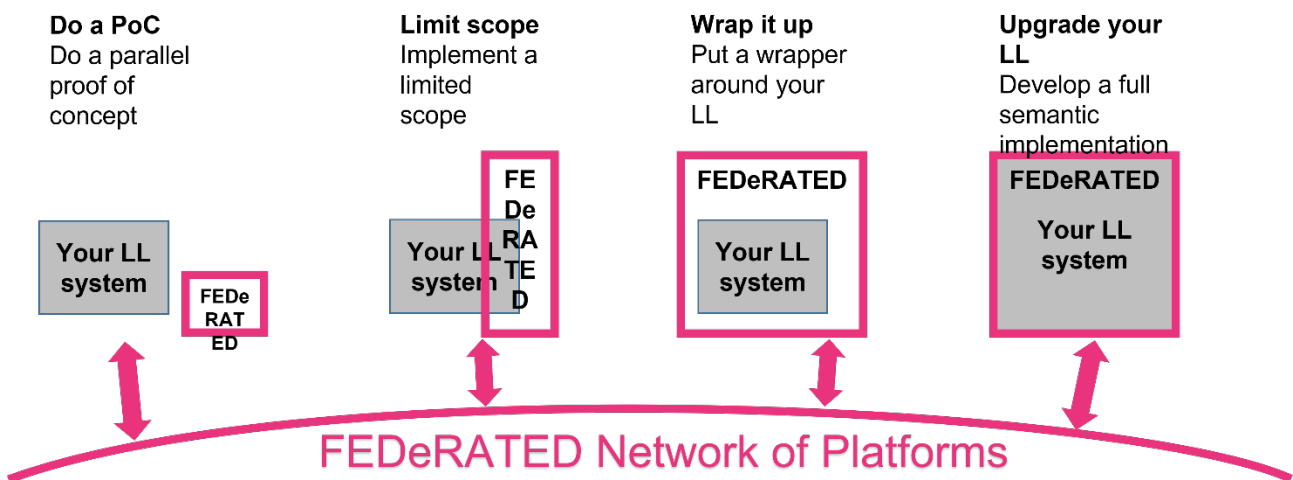


*LivingLabs implementation semantic strategies*

Martin: "BEAst can be used for many purposes. We started with fuel and carbon dioxide, because it is easiest to get a 'yes'. The re-use of materials is another purpose. You can also add invoice information, project progress and so on. All this can come in the same electronic message. You just choose what data fields you want them to fill in and that's what they will do. Of course, we need them to use the right semantics. If you transport 42 tons, it should be filled in the unit 'tne' and not 'ton'."

sAsking Martin if this complies with FEDeRATED semantics, he says: "No, this way our computer system can understand the message. We are using the BEAst communication method because it brings uniformity, instead of everybody using their own portal and language." To which he adds: "I am not a computer system scientist, but from what I gather, I suspect we are in the process of raising the basic building blocks that the construction industry needs in order to start talking 'Federated'."

Concerning the alignment of semantics, Daniel says: "It is good to realize that this project started long before FEDeRATED started. The project is up and running for quite some years now. But discussion on the relation between BEAst-ELSA and FEDeRATED have to start now. Maybe we can make FEDeRATED adjustments to the BEAst system, in order to align it more to FEDeRATED."

When asking if there are possibilities for cooperation with other Living Labs, Martin says: "I have this vision of a system taking in all kinds of environmental data in order to get the total flow, or what I call the metabolism, of each organization. We started with excavation masses and other masses, like salt or sand for winter maintenance, which come in the back of a lorry. But there is no reason to exclude information on products in packages, such as lamps, parts for our electrical centrals, etc. When we are talking about packaged goods, I think it is about the same as the other Living Labs are dealing with. So, then there would be more opportunity to integrate with other Living Labs. But we are not there yet."

## Scaling up

Martin clearly likes metaphorical expressions, expressions like "We create the melody for the future."

and "The first years we were struggling against the wind, but the last years the wind has been turning and it is now with us on a storm level." With his wind-metaphor Martin relates to developments like the successful pilots, the recent involvement of other government agencies, and the introduction of the PEPPOL standard by BEAst. But it took a lot of perseverance to let those winds change. Martin: "It has to do with repetition: telling them over and over again what the advantages of our vision are."

Concerning scaling up, the BEAst-ELSA project starts at its homebase Sweden, but it is clearly intended as a Nordic solution in the end. In one of the pilots, taking place in the North Baltic region, a Finnish contractor reports their fuel consumption for lorries and working machines. This Finnish cooperation already pushes the project across the Swedish border. And Norway is also interested, according to Martin: "Since three years we have interest from colleagues in the Norwegian Road Administration. I have a seminar with them every year. Last year they also involved their Procurement Authority, which organized webinars on this for about 60 construction companies in Norway." To which he adds: "There is also a lot to gain implementing this in central European nations like Germany, France, Poland, as so on. The BEAst homepage is in two languages now, Swedish and English. We need translations in German, French, Polish and so on, so BEAst will also be viable to SMEs in these countries." That's pretty ambitious.

Anders adds the following: "We create a data ecosystem for the construction Industry, a system for sharing business data and environmental data according to the principle of bottom up as well as top down. We work both from a strategic and an operational level." But a question that immediately pops up in this respect, is: Are we dealing with a Swedish, a Nordic, or a European strategy here? The European strategy is DTLF and FEDeRATED; the BEAst-ELSA strategy so far seems Swedish-Nordic, but that could change. The thing with Europe is, that a lot of the trust that is needed for seamless data exchange is best gathered locally, and not on a European level. And on that bottom-up, operational level BEAst-ELSA seems to be working quite well.

The BEAst-ELSA data-ecosystem represents a substantial sector – construction - and internally the system has federative features, while its green agenda complies with the course the EU is taking on sustainability. Opening the system to the European DTLF and FEDeRATED strategy on data-sharing is a logical next phase for Living Lab #22. Such a next phase implies FEDeRATED semantics in the first place, but that does not need to be a problem. As Martin said, "BEAst-ELSA is in the process of raising the basic building blocks that the construction industry needs in order to start talking FEDeRATED". Besides, the FEDeRATED consortium is in the process of turning its semantic model into plug-and-play software – the Semantic Adapter – which in time could be applied by the BEAst-ELSA system. Adding this data-ecosystem for the construction industry to the FEDeRATED network would be a great contribution to the EU's federative course in data-sharing.